

EP0005929

PCT

NOTICE INFORMING THE APPLICANT OF THE  
COMMUNICATION OF THE INTERNATIONAL  
APPLICATION TO THE DESIGNATED OFFICES

(PCT Rule 47.1(c), first sentence)

From the INTERNATIONAL BUREAU

To:

KÖSTER, Helmut  
Karl-Bieber-Höhe 15  
D-60437 Frankfurt am Main  
ALLEMAGNE

Date of mailing (day/month/year) 04 January 2001 (04.01.01)		IMPORTANT NOTICE	
Applicant's or agent's file reference			
International application No. PCT/EP00/05929	International filing date (day/month/year) 26 June 2000 (26.06.00)	Priority date (day/month/year) 26 June 1999 (26.06.99)	
Applicant KÖSTER, Helmut			

1. Notice is hereby given that the International Bureau has communicated, as provided in Article 20, the international application to the following designated Offices on the date indicated above as the date of mailing of this Notice:  
**AU,US**

In accordance with Rule 47.1(c), third sentence, those Offices will accept the present Notice as conclusive evidence that the communication of the international application has duly taken place on the date of mailing indicated above and no copy of the international application is required to be furnished by the applicant to the designated Office(s).

2. The following designated Offices have waived the requirement for such a communication at this time:  
**AT,BR,CA,CH,CN,DE,DK,EP,ES,GB,IL,IN,JP,MX,NO,PT,SE,ZA**

The communication will be made to those Offices only upon their request. Furthermore, those Offices do not require the applicant to furnish a copy of the International application (Rule 49.1(a-bis)).

3. Enclosed with this Notice is a copy of the international application as published by the International Bureau on  
04 January 2001 (04.01.01) under No. WO 01/00958

**REMINDER REGARDING CHAPTER II (Article 31(2)(a) and Rule 54.2)**

If the applicant wishes to postpone entry into the national phase until 30 months (or later in some Offices) from the priority date, a demand for international preliminary examination must be filed with the competent International Preliminary Examining Authority before the expiration of 19 months from the priority date.

It is the applicant's sole responsibility to monitor the 19-month time limit.

Note that only an applicant who is a national or resident of a PCT Contracting State which is bound by Chapter II has the right to file a demand for international preliminary examination.

**REMINDER REGARDING ENTRY INTO THE NATIONAL PHASE (Article 22 or 39(1))**

If the applicant wishes to proceed with the international application in the national phase, he must, within 20 months or 30 months, or later in some Offices, perform the acts referred to therein before each designated or elected Office.

For further important information on the time limits and acts to be performed for entering the national phase, see the Annex to Form PCT/IB/301 (Notification of Receipt of Record Copy) and Volume II of the PCT Applicant's Guide.

The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland	Authorized officer  J. Zahra
Facsimile No. (41-22) 740.14.35	Telephone No. (41-22) 338.83.38

# PATENT COOPERATION TREATY

From the:  
INTERNATIONAL PRELIMINARY EXAMINING AUTHORITY

To:

HELMUT KÖSTER  
Karl-Bieber-Höhe 15  
D-60437 Frankfurt  
ALLEMAGNE

## PCT

### WRITTEN OPINION

(PCT Rule 66)

Date of mailing (day/month/year) <b>03.04.2001</b>	
Applicant's or agent's file reference <b>J.</b>	<b>REPLY DUE</b> <b>within 3 month(s)</b> from the above date of mailing
International application No. <b>PCT/EP00/05929</b>	International filing date (day/month/year) <b>26/06/2000</b>
Priority date (day/month/year) <b>26/06/1999</b>	
International Patent Classification (IPC) or both national classification and IPC <b>E06B9/386</b>	
Applicant <b>KÖSTER, Helmut</b>	


1. This written opinion is the first drawn up by this International Preliminary Examining Authority.
2. This opinion contains indications relating to the following items:
  - I ☒ Basis of the opinion
  - II ☐ Priority
  - III ☒ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
  - IV ☐ Lack of unity of invention
  - V ☐ Reasoned statement under Rule 66.2(a)(ii) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
  - VI ☐ Certain document cited
  - VII ☒ Certain defects in the international application
  - VIII ☒ Certain observations on the international application
3. The applicant is hereby invited to reply to this opinion.
 

**When?** See the time limit indicated above. The applicant may, before the expiration of that time limit, request this Authority to grant an extension, see Rule 66.2(d).

**How?** By submitting a written reply, accompanied, where appropriate, by amendments, according to Rule 66.3. For the form and the language of the amendments, see Rules 66.8 and 66.9.

**Also:** For an additional opportunity to submit amendments, see Rule 66.4.  
For the examiner's obligation to consider amendments and/or arguments, see Rule 66.4 bis.  
For an informal communication with the examiner, see Rule 66.6.

**If no reply is filed,** the international preliminary examination report will be established on the basis of this opinion.
4. The final date by which the international preliminary examination report must be established according to Rule 69.2 is: **26/10/2001.**

Name and mailing address of the international preliminary examining authority:   European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Tx: 523656 epmu d	Authorized officer / Examiner  <b>Saretta, G</b>  Formalities officer (incl. extension of time limits) <b>Himmel, U</b>
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**I. Basis of the opinion**

1. With regard to the **elements** of the international application (*Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this opinion as "originally filed"*):

**Description, pages:**

1-15 as originally filed

**Claims, No.:**

1-25 as originally filed

**Drawings, sheets:**

1/4-4/4 as originally filed

2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

These elements were available or furnished to this Authority in the following language: , which is:

- ☐ the language of a translation furnished for the purposes of the international search (under Rule 23.1(b)).
- ☐ the language of publication of the international application (under Rule 48.3(b)).
- ☐ the language of a translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

- ☐ contained in the international application in written form.
- ☐ filed together with the international application in computer readable form.
- ☐ furnished subsequently to this Authority in written form.
- ☐ furnished subsequently to this Authority in computer readable form.
- ☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
- ☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. The amendments have resulted in the cancellation of:

- ☐ the description, pages:
- ☐ the claims, Nos.:

☐ the drawings, sheets:

5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)):

*(Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.)*

6. Additional observations, if necessary:

### III. Non-establishment of opinion with regard to novelty, inventive step and industrial applicability

1. The questions whether the claimed invention appears to be novel, to involve an inventive step (to be non-obvious), or to be industrially applicable have not been and will not be examined in respect of:

☐ the entire international application,

☒ claims Nos. 1-25,

because:

☐ the said international application, or the said claims Nos. relate to the following subject matter which does not require an international preliminary examination (*specify*):

☒ the description, claims or drawings (*indicate particular elements below*) or said claims Nos. 1-25 are so unclear that no meaningful opinion could be formed (*specify*):  
**see separate sheet**

☐ the claims, or said claims Nos. are so inadequately supported by the description that no meaningful opinion could be formed.

☐ no international search report has been established for the said claims Nos. .

2. A written opinion cannot be drawn due to the failure of the nucleotide and/or amino acid sequence listing to comply with the standard provided for in Annex C of the Administrative Instructions:

☐ the written form has not been furnished or does not comply with the standard.

☐ the computer readable form has not been furnished or does not comply with the standard.

### VII. Certain defects in the international application

The following defects in the form or contents of the international application have been noted:  
**see separate sheet**

### VIII. Certain observations on the international application

The following observations on the clarity of the claims, description, and drawings or on the question whether the claims are fully supported by the description, are made:  
**see separate sheet**

**Re Item VII**

**Certain defects in the international application**

1. The features of the preamble of claim 1 are not provided with reference signs placed in parentheses (Rule 6.2(b) PCT).
2. Claims 1 and 6 contain a reference to the drawings (Figure 7). According to Rule 6.2(a) PCT, claims should not contain such references except where absolutely necessary, which is not the case here. Furthermore, the letters  $\beta$ ,  $\alpha_R$ ,  $\alpha_S$ , and  $\gamma$  used in the set of claims are considered as reference signs to the drawings and must be placed in parentheses. Regarding the formula at the last line of claim 1, see Item VIII.
3. Claim 10 appears to relate to a process for the production of light guiding prismatic surfaces according to claim 1. The expression "process of production" instead of "production" would be preferable (see PCT Guidelines III-3.1 and III-3.2).
- 3.1 Claims 11-25 are dependent on claim 10 and they also relate to a process of production, and not to an "installation". The expression "process of production" instead of "installation" is preferred.
4. Claim 24 refers to claims 10 and 21. Claim 24 therefore contravenes Rule 6.4 (a) PCT, in that any dependent claim which refers to more than one other claim shall refer to such claims in the alternative only.

**Re Item III and VIII**

**Non-establishment of opinion with regard to novelty, inventive step and industrial applicability;**

**Certain observations on the international application**

5. The following expressions used in claim 1 are unclear and leave the reader in doubt as to the meaning of the technical features to which they refer (Article 6 PCT).

- 5.1 "...for deflecting daylight at least in the portion of the blinds disposed towards the irradiation area..." (line 2). It is not clear whether the prism-molded upper sides are built in the portion of the blinds disposed towards the irradiation area or the prism-molded upper sides deflect the daylight towards the portion of the blinds disposed towards the irradiation area.
- 5.2 "... the individual teeth..." (line 3). No "individual teeth" or equivalent feature is introduced in the claim. The reader does not know what is meant by "individual teeth".
- 5.3 "...angles of inclination" (line 5). It is not clear how this angle of inclination is measured, i.e. with reference to the vertical direction or to the horizontal plane.
- 5.4 "...irradiation cross-section..." (line 6, 14, 15, 16). It is not clear what is meant in this context by "cross-section", and in particular in connection to the irradiation. The drawings (see in particular fig. 3) convey the impression that the angle of inclination is measured on the cross-section of the blind.
- 5.5 "...and/or the tooth side..." (line 8). It would appear that the "angle of inclination" is the angle of inclination of the tooth side, see claim 1, lines 5-6.
- 5.6 "...the concentration zone is disposed either in front of blind in the irradiation cross-section and/or on the underside of upper blind behind the irradiation cross-section..." (lines 14-16). It is not clear what is meant by "in front of" and by "behind", as no orientation of the blind is given in the wording of claim 1. Furthermore, the expression "upper blind" is unclear. Light guiding blinds are positioned one above the other (see fig. 3), and any intermediate blind is an upper and a lower blind.
- 5.7 "...retro-reflected light radiation may be retro-reflected at the individual teeth at an angle  $\alpha_R < \alpha_S$ ..." (lines 17-18). It is not clear what is meant by  $\alpha_R$  and  $\alpha_S$ , as these letters are not defined in claim 1. In addition, it is not clear where and how are these  $\alpha_R$  and  $\alpha_S$  measured: therefore a relationship of "less than" is totally unclear.

Furthermore, the applicant is requested to introduce words to designate these symbols (e.g. as correctly done for "angle of inclination" above), and also to indicate the mutual relationship of "less than".

As a general remark, the applicant's attention is drawn to the fact that, in accordance with Rule 6.2(a) PCT claims shall not rely, in respect of the technical features of the invention, on references to the description or the drawings, i.e. claims must be clearly understood on the basis of their mere wording.

6. In addition, the expression used in claim 1:

"...at the upper side of light guiding blinds retroreflected radiation is concentrated and a concentration zone is formed near irradiation cross section, and the concentration zone is disposed...retro-reflected radiation may be retro-reflected..." (lines 12-18) appears to relate to a **functional** statement, which does not enable the skilled man to determine which features are necessary to perform the stated result.

These technical features shall therefore be added.

7. As a result, the set of claims is so unclear that an opinion with regard to novelty and inventive step of the claimed subject-matter cannot be established. However, with regard to claim 1, it is observed that DE 195 43 811 A (=D1) discloses (see figs. 1 and fig. 3):

light guiding blinds having prism-molded upper sides for deflecting daylight (see title), said prism molded upper sides being formed in the portion of the blinds disposed towards the irradiation area (see fig. 1),  
[said prism-molded upper sides having toothed shape (see fig. 1)], the individual teeth showing with one side towards sun incidence and with the reverse side towards the interior space (see fig. 3).

As far as claim 1 can be understood on the basis of the accompanying description and drawings, the other features of claim 1 do not appear to be disclosed in D1. ((

8. The applicant is requested to file new claims which take account of the above comments.
- 8.1 The applicant is requested to file amendments by way of replacement pages in the manner stipulated by Rule 66.8(a) PCT. In particular, fair copies of the amendments should be filed preferably in triplicate.

Moreover, the applicant's attention is drawn to the fact that, as a consequence of Rule 66.8(a) PCT the examiner is not permitted to carry out any amendments under the PCT procedure, however minor these may be.

- 8.2 In order to facilitate the examination of the conformity of the amended application with the requirements of Article 34(2)(b) PCT, the applicant is requested to **clearly identify the amendments carried out**, no matter whether they concern amendments by addition, replacement or deletion, and **to indicate the passages of the application as filed on which these amendments are based**. Any information the applicant may wish to submit concerning the subject-matter of the invention, for example further details of its advantages or of the problem it solves, and for which there is no basis in the application as filed, should be confined to the letter of reply and not be incorporated into the application (Article 34(2)(b) PCT).
- 8.3 When filing amended claims the applicant should at the same time bring the description into conformity with the amended claims. **Care should be taken during revision not to add subject-matter which extends beyond the content of the application as originally filed** (Article 34(2)(b) PCT).

# PATENT COOPERATION TREATY

# PCT

## INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference <i>J.</i>	See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416) <b>FOR FURTHER ACTION</b>	
International application No. PCT/EP00/05929	International filing date (day/month/year) 26/06/2000	Priority date (day/month/year) 26/06/1999
International Patent Classification (IPC) or national classification and IPC E06B9/386		
Applicant KÖSTER, Helmut		

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.

2. This REPORT consists of a total of 7 sheets, including this cover sheet.

☒ This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

These annexes consist of a total of 21 sheets.

3. This report contains indications relating to the following items:

- I ☒ Basis of the report
- II ☐ Priority
- III ☐ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- IV ☐ Lack of unity of invention
- V ☒ Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- VI ☐ Certain documents cited
- VII ☒ Certain defects in the international application
- VIII ☒ Certain observations on the international application

Date of submission of the demand  23/01/2001	Date of completion of this report  24.09.2001
Name and mailing address of the international preliminary examining authority:  <div style="display: flex; align-items: center;"> <div>             European Patent Office              D-80298 Munich              Tel. +49 89 2399 - 0 Tx: 523656 epmu d              Fax: +49 89 2399 - 4465           </div> </div>	Authorized officer  Saretta, G  Telephone No. +49 89 2399 7323



# INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No. PCT/EP00/05929

## I. Basis of the report

1. With regard to the elements of the international application (*Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17))*):

### Description, pages:

1-15 as received on 17/05/2001 with letter of 16/05/2001

### Claims, No.:

1-25 as received on 17/05/2001 with letter of 16/05/2001

### Drawings, sheets:

1/4-4/4 as originally filed

2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

These elements were available or furnished to this Authority in the following language: , which is:

- ☐ the language of a translation furnished for the purposes of the international search (under Rule 23.1(b)).
- ☐ the language of publication of the international application (under Rule 48.3(b)).
- ☐ the language of a translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

- ☐ contained in the international application in written form.
- ☐ filed together with the international application in computer readable form.
- ☐ furnished subsequently to this Authority in written form.
- ☐ furnished subsequently to this Authority in computer readable form.
- ☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
- ☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. The amendments have resulted in the cancellation of:

- ☐ the description, pages:
- ☐ the claims, Nos.:

**INTERNATIONAL PRELIMINARY  
EXAMINATION REPORT**

International application No. PCT/EP00/05929

☐ the drawings, sheets:

5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)):

*(Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.)*

6. Additional observations, if necessary:

**V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

**1. Statement**

Novelty (N)	Yes:	Claims	1-25
	No:	Claims	
Inventive step (IS)	Yes:	Claims	1-25
	No:	Claims	
Industrial applicability (IA)	Yes:	Claims	1-25
	No:	Claims	

2. Citations and explanations  
see separate sheet

**VII. Certain defects in the international application**

The following defects in the form or contents of the international application have been noted:  
see separate sheet

**VIII. Certain observations on the international application**

The following observations on the clarity of the claims, description, and drawings or on the question whether the claims are fully supported by the description, are made:  
see separate sheet

**Re Item V**

**Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

1. Document DE 195 43 811 A (=D1) is considered to represent the most relevant state of the art to the subject-matter of claim 1 and discloses the features of the preamble (see figs. 1 and 3), namely that:

light guiding blinds having at least partly prism-molded toothed upper sides, said prismatic molding being provided at least in the portion of the blinds disposed towards the irradiation area and serving for deflecting daylight (see fig. 1), said prismatic molded teeth of one prism side showing towards sun incidence and with one reverse prism side showing towards the interior space (see fig. 1), and two blind edges each on the sun incidence side 15 forming an incidence cross-section and two blind edges each on the interior space side forming a deflection cross section (see fig. 1), and a blind edge of a lower blind each in the irradiation cross section and a blind edge of an upper blind each in the deflection cross section forming an angle relative to the level of the irradiation cross section (this being a geometric feature, pertaining to any blind installation), and sun irradiation impinging from outside being back-reflected at an angle relative to the level of the irradiation cross section in the direction of the outer space (see fig. 3).

As far as claim 1 can be understood on the basis of the accompanying description and drawings (see Item VIII), the other features of claim 1 are not disclosed in D1. The subject-matter of claim 1 is therefore novel (Article 33(2) PCT).

- 1.1 In a window installation, the retroreflected light is normally directed into a glass façade. In glass façade, a further reflection is generated, and this final radiation produces a glare in the eye of an observer positioned in the interior space. The problem to be solved by the present invention may therefore be regarded as how to eliminate this glare.

- 1.2 The prior art is not deemed to provide an indication for the skilled man to modify the blind installation disclosed in D1 in order to arrive at the subject-matter of claim 1.

In particular, individual prismatic tooth sides having angles of inclination relative to the horizontal essentially smaller in the area of the irradiation cross-section and larger at larger distance from the irradiation cross section, where the angles of inclination of the individual teeth increase following a concave curve path increasingly ascending starting from the irradiation area towards the interior space (see in particular features a. and b. of claim 1) are not rendered obvious by the available state of the art. As far as the subject-matter of claim 1 can be understood (see Item VIII), the solution to the problem proposed in claim 1 of the present application is therefore considered as involving an inventive step (Article 33(3) PCT).

- 1.3 Claims 2-9 are dependent on claim 1 and as such also meet the requirements of the PCT with respect to novelty and inventive step.

2. Claim 10 refers to a process of production of the light guiding blinds claimed in claim 1. As far as it can be understood, and explicitly on the basis of features a) and b), the subject-matter of claim 1 is novel and inventive.
- Features a) and b) of the characterizing portion of claim 1 result from this process, as stated by the introductory lines of claim 10. Therefore, since said features result from this method of production, as far as claim 10 can be understood (see Item VIII), claim 10 and dependent claims 11-25 also meet the requirements of the PCT with respect to novelty and inventive step.

#### **Re Item VII**

#### **Certain defects in the international application**

- 3.1 Claim 6 contains a reference to the drawings ("Figure 7"). According to Rule 6.2(a) PCT, claims should not contain such references except where absolutely necessary, which is not the case here.

- 3.2 Claim 24 refers to claims 10 and 21. Claim 24 therefore contravenes Rule 6.4 (a) PCT, in that any dependent claim which refers to more than one other claim shall refer to such claims in the alternative only.
- 3.3 Document DE 196 03 293 A1, cited in the description at page 1, line 9 appears to relate to a different technical field, and in particular does not show blinds with a first retroreflecting portion.

**Re Item VIII**

**Certain observations on the international application**

4. The following expressions used in claim 1 are unclear and leave the reader in doubt as to the meaning of the technical features to which they refer (Article 6 PCT).
- 4.1 "...irradiation cross-section..." (lines 9, 11, 13). It is not clear what is meant in this context by "cross-section", and in particular in connection to the irradiation. It is however noted that an "incidence cross section" is defined in claim 1 (see lines 6-7) as being constituted by "two blind edges each on the sun incidence side". These two "cross-sections" share the same reference number (44) and it would appear that the "irradiation cross-section" is in fact the incidence cross-section.
- 4.2 "...forming an angle relative to the level of the irradiation cross section..." (line 5). It is not clear how this angle of inclination is measured, i.e. with reference to the vertical direction or to the horizontal plane. It would appear that this is the minor angle formed by the vertical and the line connecting a blind edge of a lower blind in the irradiation cross-section and the edge of the [adjacent] upper blind in the deflection cross-section (see claim 1, lines 9-11 and Fig. 3). The corresponding passage in the description (see page 3, line 5) refers to a "reflection cross-section", thus introducing a contradiction between claims and description, where it would appear that the "deflection cross-section" was meant.

- 4.3 "...sun irradiation impinging from outside being back-reflected at an angle relative to the level of the irradiation cross-section in the direction of the outer space" (lines 12-14). This expression refers to a use of the light guiding blinds claimed in claim 1 within a window installation for sun protection, rather than clearly define the blinds *per se* in terms of their technical features.  
The whole claim is in fact considered to be directed to a window installation (see also PCT-Guidelines, Section IV, III-4.8). Furthermore, it is not clear where this back-reflection angle is measured: the drawings convey the impression (see in particular fig. 3) that this is the maximum acute angle formed by a retroreflected radiation of the window installation and the vertical.
- 4.4 "...the concentration zone is disposed either in front of blind in the irradiation cross-section and/or on the underside of upper blind behind the irradiation cross-section..." (lines 14-16). It is not clear what is meant by "in front of" and by "behind", as no orientation of the blind is given by the wording of claim 1. These expressions appear to refer to a window installation, where the "front" side is the sun incidence side.
5. The terms "sol-gel", "nanomer", "silanes" used in the method claims 10, 11 and 16 respectively are unclear and leave the reader in doubt as to the meaning of the technical features to which they refer, thereby rendering the definition of the subject-matter of said claims unclear (Article 6 PCT).

## PATENT COOPERATION TREATY

## PCT

## INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

REC'D 26 SEP 2001  
WIPO PCT



8

Applicant's or agent's file reference ./.	<b>FOR FURTHER ACTION</b> See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)	
International application No. PCT/EP00/05929	International filing date (day/month/year) 26/06/2000	Priority date (day/month/year) 26/06/1999
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Applicant KÖSTER, Helmut		

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.
2. This REPORT consists of a total of 7 sheets, including this cover sheet.  
  
☒ This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).  
  
 These annexes consist of a total of 21 sheets.

3. This report contains indications relating to the following items:

- I ☒ Basis of the report
- II ☐ Priority
- III ☐ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- IV ☐ Lack of unity of invention
- V ☒ Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- VI ☐ Certain documents cited
- VII ☒ Certain defects in the international application
- VIII ☒ Certain observations on the international application

Date of submission of the demand  23/01/2001	Date of completion of this report  24.09.2001
Name and mailing address of the international preliminary examining authority:   European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Tx: 523656 epmu d Fax: +49 89 2399 - 4465	Authorized officer  Saretta, G  Telephone No. +49 89 2399 7323  

# INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No. PCT/EP00/05929

## I. Basis of the report

1. With regard to the **elements** of the international application (*Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17)*):

### Description, pages:

1-15 as received on 17/05/2001 with letter of 16/05/2001

### Claims, No.:

1-25 as received on 17/05/2001 with letter of 16/05/2001

### Drawings, sheets:

1/4-4/4 as originally filed

2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

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- ☐ the language of a translation furnished for the purposes of the international search (under Rule 23.1(b)).
- ☐ the language of publication of the international application (under Rule 48.3(b)).
- ☐ the language of a translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

- ☐ contained in the international application in written form.
- ☐ filed together with the international application in computer readable form.
- ☐ furnished subsequently to this Authority in written form.
- ☐ furnished subsequently to this Authority in computer readable form.
- ☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
- ☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. The amendments have resulted in the cancellation of:

- ☐ the description, pages:
- ☐ the claims, Nos.:

# INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No. PCT/EP00/05929

☐ the drawings, sheets:

5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)):

*(Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.)*

6. Additional observations, if necessary:

## V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

### 1. Statement

Novelty (N)	Yes:	Claims	1-25
	No:	Claims	
Inventive step (IS)	Yes:	Claims	1-25
	No:	Claims	
Industrial applicability (IA)	Yes:	Claims	1-25
	No:	Claims	

2. Citations and explanations  
**see separate sheet**

## VII. Certain defects in the international application

The following defects in the form or contents of the international application have been noted:  
**see separate sheet**

## VIII. Certain observations on the international application

The following observations on the clarity of the claims, description, and drawings or on the question whether the claims are fully supported by the description, are made:  
**see separate sheet**

**Re Item V**

**Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

1. Document DE 195 43 811 A (=D1) is considered to represent the most relevant state of the art to the subject-matter of claim 1 and discloses the features of the preamble (see figs. 1 and 3), namely that:

light guiding blinds having at least partly prism-molded toothed upper sides, said prismatic molding being provided at least in the portion of the blinds disposed towards the irradiation area and serving for deflecting daylight (see fig. 1), said prismatic molded teeth of one prism side showing towards sun incidence and with one reverse prism side showing towards the interior space (see fig. 1), and two blind edges each on the sun incidence side 15 forming an incidence cross-section and two blind edges each on the interior space side forming a deflection cross section (see fig. 1), and a blind edge of a lower blind each in the irradiation cross section and a blind edge of an upper blind each in the deflection cross section forming an angle relative to the level of the irradiation cross section (this being a geometric feature, pertaining to any blind installation), and sun irradiation impinging from outside being back-reflected at an angle relative to the level of the irradiation cross section in the direction of the outer space (see fig. 3).

As far as claim 1 can be understood on the basis of the accompanying description and drawings (see Item VIII), the other features of claim 1 are not disclosed in D1. The subject-matter of claim 1 is therefore novel (Article 33(2) PCT).

- 1.1 In a window installation, the retroreflected light is normally directed into a glass façade. In glass façade, a further reflection is generated, and this final radiation produces a glare in the eye of an observer positioned in the interior space. The problem to be solved by the present invention may therefore be regarded as how to eliminate this glare.

- 1.2 The prior art is not deemed to provide an indication for the skilled man to modify the blind installation disclosed in D1 in order to arrive at the subject-matter of claim 1.

In particular, individual prismatic tooth sides having angles of inclination relative to the horizontal essentially smaller in the area of the irradiation cross-section and larger at larger distance from the irradiation cross section, where the angles of inclination of the individual teeth increase following a concave curve path increasingly ascending starting from the irradiation area towards the interior space (see in particular features a. and b. of claim 1) are not rendered obvious by the available state of the art. As far as the subject-matter of claim 1 can be understood (see Item VIII), the solution to the problem proposed in claim 1 of the present application is therefore considered as involving an inventive step (Article 33(3) PCT).

- 1.3 Claims 2-9 are dependent on claim 1 and as such also meet the requirements of the PCT with respect to novelty and inventive step.

2. Claim 10 refers to a process of production of the light guiding blinds claimed in claim 1. As far as it can be understood, and explicitly on the basis of features a) and b), the subject-matter of claim 1 is novel and inventive.
- Features a) and b) of the characterizing portion of claim 1 result from this process, as stated by the introductory lines of claim 10. Therefore, since said features result from this method of production, as far as claim 10 can be understood (see Item VIII), claim 10 and dependent claims 11-25 also meet the requirements of the PCT with respect to novelty and inventive step.

#### **Re Item VII**

#### **Certain defects in the international application**

- 3.1 Claim 6 contains a reference to the drawings ("Figure 7"). According to Rule 6.2(a) PCT, claims should not contain such references except where absolutely necessary, which is not the case here.

- 3.2 Claim 24 refers to claims 10 and 21. Claim 24 therefore contravenes Rule 6.4 (a) PCT, in that any dependent claim which refers to more than one other claim shall refer to such claims in the alternative only.
- 3.3 Document DE 196 03 293 A1, cited in the description at page 1, line 9 appears to relate to a different technical field, and in particular does not show blinds with a first retroreflecting portion.

**Re Item VIII**

**Certain observations on the international application**

4. The following expressions used in claim 1 are unclear and leave the reader in doubt as to the meaning of the technical features to which they refer (Article 6 PCT).
- 4.1 "...irradiation cross-section..." (lines 9, 11, 13). It is not clear what is meant in this context by "cross-section", and in particular in connection to the irradiation. It is however noted that an "incidence cross section" is defined in claim 1 (see lines 6-7) as being constituted by "two blind edges each on the sun incidence side". These two "cross-sections" share the same reference number (44) and it would appear that the "irradiation cross-section" is in fact the incidence cross-section.
- 4.2 "...forming an angle relative to the level of the irradiation cross section..." (line 5). It is not clear how this angle of inclination is measured, i.e. with reference to the vertical direction or to the horizontal plane. It would appear that this is the minor angle formed by the vertical and the line connecting a blind edge of a lower blind in the irradiation cross-section and the edge of the [adjacent] upper blind in the deflection cross-section (see claim 1, lines 9-11 and Fig. 3). The corresponding passage in the description (see page 3, line 5) refers to a "reflection cross-section", thus introducing a contradiction between claims and description, where it would appear that the "deflection cross-section" was meant.

- 4.3 "...sun irradiation impinging from outside being back-reflected at an angle relative to the level of the irradiation cross-section in the direction of the outer space" (lines 12-14). This expression refers to a use of the light guiding blinds claimed in claim 1 within a window installation for sun protection, rather than clearly define the blinds **per se** in terms of their technical features.

The whole claim is in fact considered to be directed to a window installation (see also PCT-Guidelines, Section IV, III-4.8). Furthermore, it is not clear where this back-reflection angle is measured: the drawings convey the impression (see in particular fig. 3) that this is the maximum acute angle formed by a retroreflected radiation of the window installation and the vertical.

- 4.4 "...the concentration zone is disposed either in front of blind in the irradiation cross-section and/or on the underside of upper blind behind the irradiation cross-section..." (lines 14-16). It is not clear what is meant by "in front of" and by "behind", as no orientation of the blind is given by the wording of claim 1. These expressions appear to refer to a window installation, where the "front" side is the sun incidence side.

5. The terms "sol-gel", "nanomer", "silanes" used in the method claims 10, 11 and 16 respectively are unclear and leave the reader in doubt as to the meaning of the technical features to which they refer, thereby rendering the definition of the subject-matter of said claims unclear (Article 6 PCT).

## **Toothed Daylight Blinds**

The present invention relates to light guiding blinds in accordance with the preamble of the main claim.

It has been known to provide blinds having toothed shape at the upper side thereof. In DE 195 43 811 A1 and in DE 42 39 003 C2, blinds are shown having a stepped, or toothed, respectively, upper side by which retro-reflection of the sun radiation impinging on the blinds can be effected.

From DE 196 03 293 A1 or from AT 394 883 B, furthermore, blinds have been known which include, towards sun incidence, a first portion which retro-reflects incident sun radiation into the exterior space.

A disadvantage of all these prior art devices preferably arranged in an interior space behind a glazing is to be seen in that sun radiation retro-reflected at the upper side of the blinds is guided, at least partly, at a very flat angle to the inner side of the roof or façade glazing. Particularly in case of heat protection and sun protection glazings, however, an extremely disturbing and undesired glare effect is experienced generated by mirroring in the glass panes since the latter mirror part of the retro-reflected rays back into the interior space. The mirrored light impinges from the inner side of the glass panes between the blinds into the interior space or directly into the observer's eye. This is the biggest problem when using highly reflective blinds. So far, this problem can be evaded only in that, by rotating about a horizontal axis, the blinds are closed so far that the glass pane itself is no longer visible. This, however, leads automatically to an extensive darkening of the interior space whereby the daylight guiding venetian blinds lose their original function of improved illumination of the interior room with daylight. In the exterior space, on the other hand, extreme glare of the road traffic and of the buildings on the other side is generated by the reflective blinds.

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The problem of glaring on the inner side of the outer panes has not so far been scientifically examined since that problem does not come up when using commercial, colored venetian blinds. This problem came up when attempts started to specifically deflect, by means of reflective blinds, daylight into the depth of an interior space. Glare in glass panes has been known from show windows, particularly in case of bright light in the exterior space and darker interior space. Even for one versed in the art it is surprising that extreme glare can come up in glass panes even during daytime when looking from a darker interior space into a bright exterior space.

The described problems consist particularly in optimized light guiding blinds wherein in order to avoid thermal charging, the light radiation is to be reflected back to the outer space by means of one single or by two reflections. At each reflection namely, heating up comes inevitably up since the reflectors in most cases reflect only 70 to 80% of the sun radiation. The remainder is absorbed and leads to undesired heating up of the window zone.

The present invention aims at providing glare-free daylight illumination while at the same time minimizing the number of reflections. Desirable are one to two reflections maximum at the upper side of the blind. Neither the problem of overheating nor glare by the panes is acceptable.

It is, therefore, the aim of the invention to develop novel structures of light guiding blinds which reflect sun radiation impinging on the light guiding blinds by one to two reflections so that reflection of the retro-reflection in the window panes does not generate any disturbing glare effects in the interior space. Accordingly, it is the aim to control the light guidance of retro-reflection by respective design of the upper sides and undersides of the blinds so that glare reflections in the panes cannot fall into the user's eye whether in standing or in sitting position in the interior space.

This problem is solved in accordance with the characterizing portion of the present invention.

The advantage of the invention is that by the concave shape of the toothed upper side of the blinds by one single reflection, retro-reflection is in principle retro-reflected at an angle  $\alpha_R < \alpha_S$  back to the exterior space.  $\alpha_S$  constitutes the position of a connecting line between the edge of a lower blind in the irradiation area and the edge of an upper blind on the interior space side. If  $\alpha_R < \alpha_S$ , then it is guaranteed that there is no direct glare by reflection in the outer panes. For flatter angles of incidence or other positions of the blinds, respectively, glare-free retro-reflection is also guaranteed by two reflections. By the shape according to the invention of the tooth sides showing to the sun, the light reflected from the upper side of a blind to the underside of the upper blind falls at an angle  $\gamma < 90^\circ$ , which leads to a light guidance on the inner side of the outer pane from above so that a reflection of the retro-reflected radiation cannot generate any disturbing glare effect in the interior space (Figure 4). The radiation retro-reflected at the panes is again received by the upper side of the lower blind and is retro-reflected again.

The present invention constitutes a construction guideline according to which stepped or toothed blinds can be constructed so that glare in the outer panes is extensively excluded. Examples will explain the idea of the invention and interesting embodiments.

Figure 1 shows the cross section through an interior space depicting the typical glare by retro-reflected radiation in the window pane.

Figure 2 shows an analysis of the ray paths as generally produced by reflective blinds and generating glare effects.

Figures 3 and 4 show an analysis of the ray paths for the innovative light guiding blinds in operable blind positions.

Figures 5, 6, 7 and 8 show further exemplified embodiments of the blinds of the invention.

Figure 9 shows an innovative production process of microstructuring by coating with sol gel.

Figure 10 shows an enlargement of a microstructured surface.

Figure 1 shows the cross section through an interior space 10 one side 11 of which is glazed. Behind the glazing, a daylight guiding venetian blind having reflective surfaces 12 is arranged. The problem is explained based on ray path 13. Inciding light radiation impinges on blind 14 and is retro-reflected by it into glass façade 11. In glass façade 11, a reflection is generated which, as shown by ray path 15, produces glare in the eye of observer 16. All prior-art retro-reflective blind structures having reflective upper sides, even prismatic retro-reflectors, show glare effects of the kind described. Only by constructing the blinds as in accordance with the present invention is it possible to reflect light radiation 17 back into the pane so that the observer in the interior space is not glared by the light reflection in glass façade 11. The solution is obtained by constructing the light guiding system with angles of incidence  $\beta$  of the teeth which increase as from the cross section of incidence, by which it can be guaranteed that  $\alpha_R < \alpha_S$ .

Figure 2 shows an insulation glazing 20 comprising two panes 21 and 22 as well as toothed blinds 23 through 27 with the exact reflection paths based on which the glare problem is analyzed. To perform this analysis, special light radiation tracing programs have been developed by the inventor which were also employed for the construction of the blinds of the invention. Dashed ray bundle 19 on blind 23 is retro-reflected on the upper side of retro-reflecting toothed blind 24 as depicted by dash-dotted lines. It is only for the purpose of problem analysis that individual reflective ray paths 28, 29 and 30, 31, respectively, are split up and depicted separately. One portion of retro-reflection 28 is guided by one sin-

gle reflection into the exterior space, a further portion 29 is guided by a plurality of reflections between blinds 24 and 25 into the exterior space. Rays 28 and 29 are reflected at a certain percentage at the inner side of insulating glass panes 21, 22. Reflections on pane 21 show rays 30, the reflections on pane 22 show rays 31.

The reflection of the retro-reflection can be seen in the case of ray paths 32 from the interior space by glaring in pane 21. The reflection of the retro-reflection in case of ray paths 33, 34 can be experienced from the reflection and glaring on undersides 35, 36 of blinds 26, 27. These problems of glaring by reflection of retro-reflection as explained can be found in all structures of the state of the art described. These problems of glaring will be removed by the present innovation.

In Figure 3, concave-shaped blinds 40 through 43 are shown the tooth angles of incidence  $\beta$  of which increase starting from irradiation cross section 44. Light radiation 45 incident within an angle  $\beta$  is retro-reflected by one single reflection into the irradiation cross section so that a concentration area 46 is formed which, in Figure 3, is situated in front of the irradiation cross section. This is reached in that the angles of incidence  $\beta$ , for instance, starting from the irradiation cross section increase as a concave curve 47 to the interior space. Individual teeth 48 through 55 form projected segments of curve 47. The teeth subjected to incident light radiation may be of plane or arched shape. Even if the blind is composed of only two and a half teeth, as similar to Figure 7, the construction guideline as described remains valid. The construction guide line is even valid in case of blind structures having only one single tooth. The larger the individual steps become the more necessary it becomes to concavely arch the tooth upper side. Ideally, though not necessary, curve 47 is approximate to a parabola having a focal point in concentration area 46. The tooth sides subjected to sun light may also be of concave or parabolic shape. This is particularly the case in structures according to Figure 7 or for blinds having only one single tooth. In the case of smaller angles of incidence  $\delta$  shown in Figure 4 either readjust-

ment of the blinds is necessary by providing them in a steeper position or the concentration area moves to the underside of the upper blind.

This process is shown by Figure 4. A light bundle 50 is essentially reflected by one single reflection from the upper side of blind 51 to the underside of blind 52. The blind should be in such an angular position that concentration area 53 lies in portion 54 of blind 52 disposed towards the area of incidence. In this case, angles of impact  $\gamma < 90^\circ$  are formed between blind underside 55 and a retro-reflected ray 56 in point 64. Under these conditions, the light is guided as a ray bundle 57 from above onto glazing 58, 59 so that reflections 60, 61, 62 on a first pane 58 or reflections 63 on a second pane 59 impinge, in principle, on the upper side of the lower blinds. According to the invention, the reflections in panes 58, 59 are in any case glare-free for the observer in the interior space.

Reflections 80, 81 in panes 70, 71 of Figure 3 are glare-free, too, since the light from panes 70, 71 is reflected to the underside of the upper blinds. Contrary to the prior art where the light reflected on underside 35, 36 of upper blinds 26, 27 is deflected into the observer's eye and to the bottom of the interior space, in Figure 3 the light is guided by the underside of blinds 43, 44 onto the upper side of blinds 42, 43. Thereby, glare as a consequence of reflection 80, 81 of retro-reflected radiation 82 is also avoided at the undersides of the light guiding blinds. The mirroring of the reflection is not distinguishable. Only minutest radiation portions are steeply, i.e. also freely from glare, deflected to the bottom of the interior space.

While in each of Figures 3 and 4 linear, or point-shaped, respectively, light concentration is generated, such concentration is not necessarily essential. In order to avoid point-shaped heating-up of the blinds, the upper side of the blinds may so be designed that the light is distributed over a certain concentration zone.

Figures 5 and 6 illustrate a further embodiment of the invention and the optical functions thereof at determined angles of incidence. In each case, the

upper sides 100, 101 and the undersides 102, 103 of s-shaped blinds are shown. Figure 5 shows a light guiding blind having a first portion 104 serving for retro-reflection and a second portion 105 serving for light flooding into the interior space. The first portion operates as in accordance with the explanations in connection with Figures 3 and 4. The same applies to the blind of Figure 6.

Figure 7 shows a blind according to the invention which includes only two teeth, 106 and 107. The teeth are again designed as in accordance with the explanations in connection with Figures 3 and 4.

A second portion 108 guides light into the interior space. Contrary to Figures 3 through 6, the underside of the blind is toothed as well. For individual reflection paths, particularly in case of sun inciding at a small angle, it is very well possible that reflections between the blinds as well as on the underside of the upper blind might occur. It is essential of the invention that the blinds can retro-reflect sun irradiation having high angles of incidence, i.e. the overheating summer sun, by mere one or two reflections.

One interesting embodiment of the invention is so designed that the undersides of blinds 52, in portion 54 disposed towards the irradiation area, are provided with photovoltaic solar cells. In that case, the system also serves as a concentration installation for sun radiation.

A particularly interesting further embodiment consists in the structure of a raster element of blinds according to the invention wherein the horizontally-arranged blinds are orthogonally penetrated by further blinds which are either flat-shaped or toothed as well. The orthogonally penetrating blinds may also be made concave, convex or v-shaped. Such raster elements are particularly suited in flat or inclined glass roofs. In that case, the blinds are fixed in their angles of incidence.

The tooth structures of the light deflecting blinds according to Figures 3, 4, 5 and 6 are produced for instance by a rolling and embossing process and are brought into their particular concave/convex shape by a further roll-molding process. It is also possible to structure the light guiding blinds on their upper sides in tooth shape by one single rolling process from a thin strip and provide them, at the same time, with the desired shape by rolling. Covering a carrier material with micro structured foils is possible, too.

The light guiding blinds have a width of  $< 15$  mm and may be installed in the air gap of an insulating glass. However, the light guiding blinds may also take a width of  $> 30$  cm and may be covered, at least from above, by a pane or a foil. Still larger light guiding blinds may also be composed of a plurality of individual parallel blind elements. One could also think of casting the blinds into a transparent plastic material and making additional use of prismatic effects for light deflection. Tooth structures applied by an embossing process are hardly visible by the human eye and yet may optically, radiation-geometrically, operate in the way described. It is also possible to print holograms on the blinds, to roll in holograms or to laminate the blinds with foils carrying inscribed holograms. In what way ever the light guiding effects at the blind upper side are produced, the present invention describes the constructional method of light guiding optics.

The light guiding blinds of Figure 7, for instance, are rolled-shaped from a reflective thin strip. A suitable method is also the aluminum pressing process with subsequent polishing, lacquering, eloxadizing, chromium-plating, metallic evaporation etc. It has also been known to employ a production process for light guiding blinds having prismatic surface shape by embossing, for instance in aluminum, by means of embossing rollers. The disadvantage is the little mold exactness of the individual tooth tips since under the embossing calender the material flows only under extreme pressure into the embossing structure. Hard aluminum material as employed in the blind-producing industry does not completely flow into the tooth tips. Plastic materials which are softer and may better be

molded tend to restore, particularly in their behavior over a long period of time and under temperature change in case of inciding sun radiation.

Microstructures have the disadvantage of collecting dust and soil. Dust particles are particularly smaller than those microstructures and stick to the prisms. For the dust particles, the prismatic structure constitutes a very large surface which may correspondingly become soiled.

A further disadvantage of the microstructures is the danger of injuring the surface. The smaller the structures the more homogeneous becomes the surface for individual charges. In other words, the sensitivity against scratches during subsequent treatment, tool traces or later wearing effects is reduced if it becomes manageable to make the structures substantially smaller.

In order to guarantee the desired exact glare-free light guiding behavior of the light guiding blinds having a toothed upper side, a 100 percent molding of the calculated light guiding surface is necessary, which cannot be obtained by means of the state-of-the art rolling methods or calender techniques. In particular, the edges of the individual teeth have to be sharp-edged since round edges constitute glare danger and irritations of the ray paths.

It is, therefore, the aim of the present invention to develop a coating and a coating technology adapted to each other which makes possible a molding exactness in the nano range and at the same time cures to such hard layers that neither mechanical strains during further processing or during use (scratches) nor thermal charges will lead to an impairment of the surface quality.

It is a further aim of the production process of the invention to develop a coating material together with an adapted coating process which makes possible the production of specifically directed material compositions and permits defined material properties such as for instance mirror effects for short and long-wave

radiation at the surface, or a transparent coating on reflective underground, or self-purification effects.

Finally, it is the aim of the invention to provide a glare-free, very exact, light guiding venetian blind which permits economic production by one single production step.

The problem is solved in that surface molding is performed by means of a sol-gel coating into which either a prismatic surface is embossed by a rotation embossing roller or on which a prismatic surface is printed by a rotary printing roller, and which, during the course of, or immediately after, the embossing or printing step, receives at least an initial curing by feeding electromagnetic radiation and/or electron bombardment.

The advantage of the production process of the invention is a microscopically finely structured surface of ceramic hardness which can be embossed with least force and provides for a very exact and sharp-edge prismatic structuring up to nano range as well as a permanent maintenance-free surface.

The advantage of the production process of the invention, furthermore, is to emboss the prismatic structure into a sol-gel coating which, by a suitable material composite, may be provided with specific properties, on one side, and which safeguards the specific surface structure also in the nano range, on the other. The sol-gel coatings in combination with the coating process make it possible to obtain the functions of light refraction, light reflection, self-purification, mirror effect, surface hardness, surface brilliance, electric charge, electric conductivity by one single working operation.

The properties mentioned do not only constitute a question of the material composite but rather of process technology, i.e. of the molding of the reflectoric structures, or nano structures, respectively, and of the curing of these structures in molding processes, or immediately after the molding process, in order to stabi-

lize the structures in the transfer phase from sol to gel, or for final curing, respectively. The term "immediately" refers also to tenth of seconds or shorter periods of time.

While all sol-gel coatings may be applied onto a work piece by prior art wet processes such as rolling, doctor blading, wiping, pointing, whirling, dipping, embossing, the process steps for producing the light guiding blinds from a sol-gel material composite constitute a well balanced unit of material, embossing, curing for obtaining the desired precision in light deflection. .

The advantage of the sol-gel coating is the built-up of a micro structure hardly recognizable by the human eye, or not recognizable at all, which is so fine that hardly any roughness of the surface can be perceived. This makes possible a particularly economic, thin coating thickness since only an extremely low consumption of coating material is required.

Figure 9 shows the principle of the production. Blind material 215 is unreeled as a strip from reel 210 and is provided with the sol-gel coating by means of a prior art wet coating process at coating station 211. Subsequently, the coated material is guided through roller pair 212. Lower roller 214 may for instance be smooth while upper roller 213 is structured and embosses its structure onto the sol-gel coating. Curing of the sol-gel coating is performed immediately behind the embossing roller. Curing is performed either by thermal irradiation 217 and/or by ultraviolet irradiation 217. The kind of irradiation depends on the material composite. It is preferred to employ polymerizing coating materials. After curing, the coated blind material might be re-reeled again onto a reel 216. It might also be of advantage to first provide thermal solidification by heat treatment up to 100° C and subsequently obtain curing by ultraviolet irradiation, which is a two-step process. It is of particular advantage to provide the sol gel prior to the embossing process with an initial stiffness by means of light and/or thermal treatment and/or electron bombardment so that the micro structure cannot run any more.

It would for instance also be possible to coat the blind material on both sides, which means that in such case the lower roller 214 had to be shaped as embossing roller as well. It is furthermore possible to feed instead of the strip material, individual pieces, i.e. individual blinds cut to length and already profiled, into the coating apparatus. In place of an embossing roller, a printing roller may be employed as well wherein in such case the printing roller is coated in a well-known manner with the material composite and the printing roller transfers the material composite onto the work piece.

It is also an advantage of the process that upper and under sides may be coated during one working step with different material composites considering that the blinds have to fulfil different optical and light-technical functions on the upper and under sides thereof. In order to avoid glare, the underside may for instance be equipped with an anti-reflex coating consisting of photopolymerizable ceramic nano particles.

Figure 10 shows as an example a section of a finely-structured surface 230 in 400 fold enlargement. At this scale, one can see that the individual teeth constitute a complex mirror system comprising concave-shaped surfaces 230. In order to guarantee precise ray guidance, this surface should exactly be imaged. The required precision becomes possible by means of sol-gel coating by a printing or embossing process applied for instance on an aluminum blind.

In hitherto-known printing or coating processes for venetian blinds, **organic** colors or lacquers are employed which have the tendency to run or draw smooth at the surface. In general, this is in fact a desired property. According to the invention, however, particular **inorganic** sol-gel coatings are selected having the ability to permanently image embossings even in the nanometer range. It is also new to employ rotary, printing or coating processes for such sol-gel coatings. Material composites for the production of microstructured light guiding mirror surfaces or dereflective blind under sides have not so far been known either.

The advantage of sol-gel coatings is seen in the built-up of three-dimensional inorganic networks from a liquid phase which when cured come up to the hardness of ceramic materials. The inorganic networks may be incorporated in organic networks such as photopolymerizable acrylates so that organic and inorganic networks penetrate each other, the organic networks serving as supports in the sol-gel phase and for pre-solidification. The advantage of organic networks, therefore, consists in the possibility of curing the coating by heat and/or ultraviolet irradiation.

In the following, special requirements and formulations of the sol-gel coatings will be described, on one hand, and the preparation, or structuring, respectively, of the printing or embossing rollers for obtaining the specific effects described above, on the other, will be explained.

Into a polymerizable nano composite, nano scale particles may be incorporated. It is furthermore possible to incorporate precious metal colloids into the sol-gel coatings in order to thereby generate brilliance and mirror effects for light guidance. In this case, the work piece does not need any mirror coating. One working step is saved. Of particular advantage is the realization of a silver mirror of highest efficiency which will not, in the course of the time, oxidize and become clouded. A further protective layer is not necessary either.

Sol-gel coatings, moreover, make it possible to add nano particles to the composite (for instance  $\text{TiO}_2$  or  $\text{Ta}_2\text{O}_5$ , or  $\text{SiO}_2$  or  $\text{SiO}_2/\text{ZrO}_2$ ).

In order to avoid undesired brilliance effects, for instance on portions of the blind undersides, or static effects, the sol gel may also be added self-organizing small particles which are generated by embossing an adhesive layer and show little adhesion. Such surfaces possess a super repulsion effect having high scratch and abrasive resistance and self-purification effect in view of a surface structure having a super hydrophobicity effect. These properties are ob-

tained by a micro rough surface in the nano range with which the prism structured embossing or printing roller is covered.

As sol-gel materials, organically modified alkoxides and nano scale colloidal  $\text{SiO}_2$  particles may be employed as well. Such coating materials may dry in a thermal or a photochemical process during the embossing process and cure to yield a vitreous layer. Structural heights may be formed from 1 nm to 100 nm. In place of  $\text{SiO}_2$  particles, nanomeres may be employed as well. The particular advantage of this composite is that it is possible to emboss it with very low pressures so that the embossing rollers may be provided with flexible silicone surfaces which, on their part, may easily be produced and with a view to the small embossing pressure show only little wear.

The rollers, too, i.e. the surface of the rollers, for embossing, or printing, respectively, may be made of an inorganically/organically modified nano composite material into which, by means of photo-lithography and subsequent development or by means of photo structuring, holograms or the micro structure is incorporated through which, by the rotation molding and rotary printing process, the sol-gel coating of the work piece is surface treated.

Based on the sol-gel materials, or the sol-gel coating technique, respectively, special functional layer systems such as electro-chromic layers, intercalation layers, and transparent electrolytes, may be applied as well.

The invention relates as well to the application of further layers, for instance as electromagnetic screen or antistatic coating.

While in Figure 10, prismatic structures have been shown reflecting light radiation on the surfaces as a result of the mirror effect, is also possible to apply highly transparent composites having prismatic structures 30 onto a mirror, for instance a reflective aluminum blind. In that case, the light is refracted in the layer and is guided.

The coating is applied either onto strip material split to venetian blind width or onto large working widths with structures repeating in parallel. The broad strips are subsequently, in a further operation step, split to a smaller venetian blind strip.

## Patent claims

### Claim 1

Light guiding blinds having, at least partly, prism-molded upper sides for deflecting daylight at least in the portion of the blinds disposed towards the irradiation area, the individual teeth showing with one side towards sun incidence and with the reverse side towards the interior space, characterized in that

- a) the tooth sides showing towards sun incidence have angles of inclination  $\beta$  essentially smaller in the area of the irradiation cross section and larger at larger distance from the irradiation cross section, and
- b) the angles of inclination  $\beta$  and/or the tooth side showing towards sun incidence (Figure 7) increase continuously or discontinuously or irregularly following a concave curve path (47) increasingly ascending starting from the irradiation area towards the interior space, and
- c) at the upper side of light guiding blinds (41, 51) retro-reflected radiation (82) is concentrated and a concentration zone (46, 53) is formed near irradiation cross section (44) and the concentration zone is disposed either in front of blind (42) in the irradiation cross section and/or on the underside of upper blind (52) behind the irradiation cross section, and
- d) on the upper side of a light guiding blind (51, 41) retro-reflected light radiation may be retro-reflected at the individual teeth at an angle  $\alpha_R < \alpha_S$ .

### Claim 2

Installation according to claim 1, characterized in that said light guiding blinds are readjusted in a position through which at the upper side of said blinds retro-reflected light radiation (56) impinges at an angle  $\gamma < 90^\circ$  on the underside of blinds (55).

### Claim 3

Installation according to claim 1, characterized in that said light guiding blinds are manufactured by a rolling process as a flat blind having uniform tooth

formation and by subsequent concave/convex molding of the blind the individual teeth are brought into their ascending angular position  $\beta$ .

**Claim 4**

Installation according to claim 1, characterized in that said light guiding blinds include at least one portion (105, 108) oriented towards the interior space which, at least vis-à-vis a first portion (104), includes flatter tooth angles  $\beta$  or no tooth angles and may be plane, concave or convex arch shaped.

**Claim 5**

Installation according to claim 1, characterized in that said light guiding blinds (100 through 103) are S-shaped.

**Claim 6**

Installation according to claim 1, characterized in that said light guiding blinds (Figure 7) consist of at least one retro-reflective part and at least one second light guiding element for light guidance towards the interior space wherein said retro-reflector consist of at least two teeth (106, 107), the first tooth (106) including on the side facing the sun light a flat angle of inclination  $\beta$ , and at least one further tooth (107) including a steeper angle of inclination  $\beta$ , and that at least the sun-irradiated sides of the teeth are concavely arched.

**Claim 7**

Installation according to claim 1, characterized in that said blinds consist of at least one retro-reflective part and at least one second light guiding element for light guidance towards the interior space wherein said retro-reflector consists of at least one single tooth, at least the sun-irradiated side of said tooth being concavely arched.

**Claim 8**

Installation according to claim 1, characterized in that said light guiding blind upper sides are a holograms.

**Claim 9**

Installation according to claim 1, characterized in that on the underside in the area of portion (54) of blinds (52) disposed towards the irradiation area, energy converters for short-wave radiation into long-wave radiation and/or into current are provided.

**Claim 10**

Production of light guiding prismatic surfaces according to claim 1 in a rotary process by feeding carrier material through a pair of rollers having structured surface, characterized in that microstructuring is obtained by means of a sol-gel coating into which either a prismatic-microstructured surface is embossed by a rotary embossing roller or a prismatic-microstructured surface is imprinted by a rotary printing roller, and which before, during or immediately after embossing or imprinting receives at least an initial curing by being fed electromagnetic radiation or by electron bombardment.

**Claim 11**

Installation according to claim 10, characterized in that said sol-gel coating is a nanomer.

**Claim 12**

Installation according to claim 10, characterized in that said sol-gel coating constitutes a synthesis of a viscous sol having a high solid content on an  $\text{SiO}_2$  base, curing after thermal treatment to constitute a vitreous layer.

**Claim 13**

Installation according to claim 10, characterized in that the substrate of said sol-gel coating constitutes a synthesis of inorganic-organic nano composites.

**Claim 14**

Installation according to claim 10, characterized in that said substrate of said sol-gel coating constitutes a polymerizing nano composite into which nano scale inorganic particles are incorporated.

**Claim 15**

Installation according to claim 10, characterized in that into said substrate of said sol-gel coating precious metal colloids are incorporated.

**Claim 16**

Installation according to claim 10, characterized in that said substrate of said sol-gel coatings is formed of polymerizable silanes and cures through photo polymerization under the irradiation of ultraviolet light

**Claim 17**

Installation according to claim 10, characterized in that said substrate of said sol-gel coatings is produced by ceramic nano particles having a high metal oxide content ( $\text{SiO}_2$ ,  $\text{TiO}_2$ ).

**Claim 18**

Installation according to claim 10, characterized in that said coatings consist of hydrolyzed methacryl-oxypropyl-trimethoxysilane and said micro structuring is imprinted by an embossing roller.

**Claim 19**

Installation according to claim 10, characterized in that said substrate of said sol-gel coatings consists of organically modified alkoxides and nano scale  $\text{SiO}_2$  particles into which prismatic structures < 30 nm are imprinted.

**Claim 20**

Installation according to claim 10, characterized in that said substrate of said sol-gel coatings is a metal colloid containing coating.

**Claim 21**

Installation according to claim 10, characterized in that the structure of the rollers for embossing or for imprinting is produced of an inorganic/organic nano composite material into which, either by photolithography and subsequent development or by photo structuring, holograms or Fresnel structures are incorporated through which, in the rotary molding or the rotary printing process, said sol-gel coating of the work piece becomes surface structured.

**Claim 22**

Installation according to claim 10, characterized in that said sol-gel coating applied onto said work piece is sprayed, in a second working step, with redistinguishable ITI nano particles and this sprayed-on layer cures under ultraviolet light as a protective layer.

**Claim 23**

Installation according to claim 10, characterized in that the prismatically molded surfaces are covered with transparent conductive layers in that said layers of  $\text{In}_2\text{O}_3$ ,  $\text{SnO}_2$  and Sb are sprayed with high temperatures onto a hot work piece surface having temperature of more than 300°C.

**Claim 24**

Installation according to claims 10 and 21, characterized in that said prismatically molded molding or printing rollers are structured having a low energy surface with self-structuring nano particles so that with a view to repulsion effects a self-purifying surface results on the work piece.

**Claim 25**

Installation according to claim 10, characterized in that said prismatically molded molding or printing rollers are coated with a lubricant lacquer based on inorganic/organic nano composites.

## PCT

## INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference	<b>FOR FURTHER ACTION</b> see Notification of Transmittal of International Search Report (Form PCT/ISA/220) as well as, where applicable, item 5 below.	
International application No. PCT/EP 00/ 05929	International filing date (day/month/year) 26/06/2000	(Earliest) Priority Date (day/month/year) 26/06/1999
Applicant KÖSTER, Helmut		

This International Search Report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This International Search Report consists of a total of 3 sheets.

☒ It is also accompanied by a copy of each prior art document cited in this report.

**1. Basis of the report**

- a. With regard to the **language**, the international search was carried out on the basis of the international application in the language in which it was filed, unless otherwise indicated under this item.

☐ the international search was carried out on the basis of a translation of the international application furnished to this Authority (Rule 23.1(b)).

- b. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international search was carried out on the basis of the sequence listing :

☐ contained in the international application in written form.

☐ filed together with the international application in computer readable form.

☐ furnished subsequently to this Authority in written form.

☐ furnished subsequently to this Authority in computer readable form.

☐ the statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.

☐ the statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished

2. ☐ **Certain claims were found unsearchable** (See Box I).

3. ☐ **Unity of invention is lacking** (see Box II).

4. With regard to the **title**,

☒ the text is approved as submitted by the applicant.

☐ the text has been established by this Authority to read as follows:

5. With regard to the **abstract**,

☐ the text is approved as submitted by the applicant.

☒ the text has been established, according to Rule 38.2(b), by this Authority as it appears in Box III. The applicant may, within one month from the date of mailing of this international search report, submit comments to this Authority.

6. The figure of the **drawings** to be published with the abstract is Figure No.

☐ as suggested by the applicant.

☐ because the applicant failed to suggest a figure.

☒ because this figure better characterizes the invention.

3

☐ None of the figures.

# INTERNATIONAL SEARCH REPORT

International application No.

PCT/EP 00/ 05929

## Box III TEXT OF THE ABSTRACT (Continuation of item 5 of the first sheet)

- line 1, delete from "The present invention..." until line 2 "...micro structuring".
- line 20, delete from "Surface molding is made..." until line 25 "...and/or electronic bombardment".

## INTERNATIONAL SEARCH REPORT

National Application No

PCT/EP 00/05929

## A. CLASSIFICATION OF SUBJECT MATTER

IPC 7 E06B9/386

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 E06B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, PAJ

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	DE 195 43 811 A (KOESTER HELMUT DIPL ING ARCHIT) 20 March 1997 (1997-03-20) column 5, line 12 - line 19; figures -----	1



Further documents are listed in the continuation of box C.



Patent family members are listed in annex.

## ° Special categories of cited documents :

- "A" document defining the general state of the art which is not considered to be of particular relevance
- "E" earlier document but published on or after the international filing date
- "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- "O" document referring to an oral disclosure, use, exhibition or other means
- "P" document published prior to the international filing date but later than the priority date claimed

- "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
- "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
- "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.
- "&" document member of the same patent family

Date of the actual completion of the international search

20 October 2000

Date of mailing of the international search report

27/10/2000

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# INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/EP 00/05929

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
DE 19543811 A	20-03-1997	NONE	